

Recommended Fluoride Action Level

A fluoride value of 10 mg/L is recommended as a do not drink or use limit.

Concentrations below 10 mg/L are protective of potential nausea, vomiting and gastric pain that may occur at higher values. A fluoride value of <10 mg/L is recommended to also protect against skin rashes and itching that may occur as a result of dermal contact with the water.

The acute health effects of fluoride may include severe nausea, vomiting, excess saliva production, abdominal pain and diarrhea. More serious acute health effects are convulsions, irregular heartbeat and coma. After being ingested into the stomach, 50% of sodium fluoride is typically converted into hydrofluoric acid (HF), which is absorbed through the mucous membrane of the stomach at a rate 1,000,000 times greater than F⁻. Fluoride then circulates in the body and returns to the mouth through the salivary glands. HF formation in the stomach is pH dependent, with more being formed at lower pH values. The U.S. Center for Disease Control (CDC 1995) has recommended that, if the fluoride level in a community water system exceeds 10 mg/L, the fluoridation system be turned off immediately in order to protect public health. At 10 mg F/L, it is estimated that a 2 year old, weighing 10 kilograms and drinking one liter of water would receive a fluoride dose that is associated with gastrointestinal symptoms, requiring treatment. At higher levels more severe health effects would occur.

Infants (ages birth to 12 months) who are fed reconstituted infant formula mixed with tap water as a primary source of nutrition represent a high risk group, mainly due to their higher ingestion rate per smaller unit of body weights. The American Dental Association recommends the use of fluoride-free water for mixing formula. Infants and young children are also more susceptible to the effects of fluoride on the thyroid gland (endocrine disruption) and to dental fluorosis (NRC, 2006).

There is little information about the effects of fluoride from non-drinking water exposures. One community health study reported that skin contact with 50 mg/L fluoride caused itching and skin rashes (Petersen et al., 1988). No other studies on the water concentration of fluoride and dermal effects were found.

10 mg F/L of water is recommended as a do not use value for the following reasons:

- 50 mg/L fluoride is a frank effect level and dermal effects at lower concentrations, including 10 mg/L, cannot be ruled out;
- If water at concentrations higher than 10 mg F/L is available to the public, its likely that people may accidentally drink the water and become ill; and,
- Selecting 10 mg F/L as a do not drink or use value will be easier to communicate and will minimize confusion and/or mishaps compared to having multiple values for consumptions versus other uses.

The U.S. Environmental Protection Agency (US EPA 1986) has set an enforceable drinking water standard for fluoride of 4 mg/L (some people who drink water containing fluoride in excess of this level over many years could get bone disease, including pain and tenderness of the

bones). EPA has also set a secondary fluoride standard of 2 mg/L to protect against dental fluorosis. Dental fluorosis, in its moderate or severe forms, may result in a brown staining and/or pitting of the permanent teeth. This problem occurs only in developing teeth, before they erupt from the gums. Children under nine should not drink water that has more than 2 mg/L of fluoride on a long-term basis. The EPA MCL of 4.0 mg/L is based on chronic effects and risk balancing. The Secondary MCL of 2.0 mg/L has been set to protect against dental fluorosis.

REFERENCES

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Petersen et al. (1988). Community health effects of a municipal water system hyperfluoridation accident. *American Journal of Public Health*. 78(6): 711-713.

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